

WE CLAIM:

1. A device for controlling fluid flow, of the type having a variable orifice and configured to use a pressure signal, comprising:
 - a fluid flow conduit having at least one planar inner wall extending in a longitudinal direction of the conduit; and
 - an element having a linear edge configured to mate with the at least one planar inner wall of the fluid flow conduit to form a seal therewith, the element being movable in a direction transverse to the longitudinal direction between an open position wherein fluid flows through the conduit and a closed position wherein the element substantially shuts off fluid flow in the conduit.
2. The variable orifice of claim 1, wherein the conduit has a rectangular cross-section and the element is substantially rectangular shaped.
3. The variable orifice of claim 1, wherein the conduit includes at least one contoured sidewall and the element includes at least one edge having a curvature that substantially matches the cross-sectional shape of the contoured sidewall of the conduit.
4. The variable orifice of claim 1, wherein the pressure signal is provided by a pressure sensor mounted in the housing.
5. The variable orifice of claim 1, wherein the pressure signal is provided by a pressure device mounted outside the housing either upstream or downstream of the device.
6. A device for measuring fluid flow, of the type having a variable orifice and configured to use a pressure signal, comprising:
 - a fluid flow conduit having at least one planar inner wall extending in a longitudinal direction of the conduit; and

an element having a linear edge configured to mate with the at least one planar inner wall of the fluid flow conduit to form a seal therewith, the element being movable in a direction transverse to the longitudinal direction between an open position wherein fluid flows through the conduit and a closed position wherein the element substantially shuts off fluid flow in the conduit.

7. The variable orifice of claim 6, wherein the conduit has a rectangular cross-section and the element is substantially rectangular shaped.

8. The variable orifice of claim 6, wherein the conduit includes at least one contoured sidewall and the element includes at least one edge that has a curvature that substantially matches the cross-sectional shape of the contoured sidewall of the conduit.

9. The variable orifice of claim 6, wherein the pressure signal is provided by a pressure sensor mounted in the housing.

10. The variable orifice of claim 6, wherein the pressure signal is provided by a pressure device mounted outside the housing either upstream or downstream of the device.

11. A device for controlling fluid flow, of the type having a variable orifice and a pressure sensor, comprising:

a conduit having first, second and third segments, the first and third segments having a circular cross-section, and the second segment having a non-circular cross-section with at least two planar portions and being positioned between the first and third segments; and

an element having at least one linear edge configured to engage the second segment to substantially shut off fluid flow in the conduit.

12. A device for measuring and controlling fluid flow, comprising:

a conduit having an input portion with an inner circular cross-section, and an orifice portion with an inner rectangular cross-section;
a pressure sensor configured to measure pressure within the conduit; and
a movable element adapted and configured to engage the inner rectangular cross-section of the orifice portion to control fluid flow.

13. An apparatus for controlling and metering fluid flow, comprising:
a housing including:

a fluid flow conduit having first, second and third portions along a length of the conduit, the first and third portions having a circular cross-section and the second portion including at least one planar sidewall and being positioned between the first and third portions;

an element bore extending transverse to the conduit and providing access to the second portion; and

first and second sensor chambers each having an inlet and an outlet, the inlet and outlet of the first sensor chamber being in fluid communication with respective first and second portions of the conduit, and the inlet and outlet of the second sensor chamber being in fluid communication with respective second and third portions of the conduit;

an element having a linear edge configured to mate with the at least one flat sidewall to form a seal therewith and movable in the element bore between an open position wherein fluid flows through the conduit and a closed position wherein the element substantially shuts off fluid flow through the conduit; and

first and second pressure sensors mounted in respective first and second sensor chambers and configured to determine a pressure differential in the housing.

14. The apparatus of claim 13, wherein the first and third portions of the conduit have a circular cross-section, and the second portion of the conduit has a rectangular cross-section.

15. The apparatus of claim 13, wherein the second portion of the conduit includes a flow control section having a smaller cross-sectional area than the larger cross-sectional area of the remaining sections of the second portion.

16. The apparatus of claim 15, wherein the flow control section includes an inlet and an outlet that each include at least one tapered surface that transitions from the smaller cross-sectional area to the larger cross-sectional area of the remaining sections of the second portion.

17. The apparatus of claim 13, wherein the element includes a face surface having a leading edge facing upstream to the fluid flow and a trailing edge facing downstream to the fluid flow, the face surface being substantially planar and the trailing edge including a taper

18. The apparatus of claim 13, wherein the housing is divided into at least first and second portions along a plane that passes through a center of the conduit.

19. The apparatus of claim 13, wherein the first and second sensor chambers are accessible through respective first and second sensor bores that extend transverse to the conduit.

20. The apparatus of claim 19, wherein the first and second sensor bores extend in a direction perpendicular to the direction of the element bore.

21. A method of controlling fluid flow through a device that includes a pressure sensor, a conduit having a first portion with a circular inner cross-section and a second portion with a rectangular inner cross-section, and a movable element having at least one linear edge, the method comprising the steps of:

moving the movable element in the conduit in a direction transverse to a direction along a length of the conduit; and

engaging the linear edge of the movable element with the at least one flat sidewall of the conduit when in the closed position to form a seal with the at least one flat sidewall.

22. The method of claim 21, wherein the device further includes a housing, and the conduit extends through the housing, the housing including a sensor chamber positioned between and in fluid communication with the first and second portions of the conduit, and a element bore extending transverse to the conduit and providing access to the second portion of the conduit, and the movable element extends through the element bore.

23. A method of metering fluid flowing through a device that includes a conduit having a first portion with a circular inner cross-section and a second portion with a rectangular inner cross-section, and a movable element having at least one linear edge, and is configured to use a pressure signal, the method comprising the steps of:

moving the movable element in the conduit in a direction transverse to a longitudinal direction along a length of the conduit; and

engaging the linear edge of the movable element with the at least one flat sidewall of the conduit when in the closed position to form a seal with the at least one flat sidewall.

24. The method of claim 23, wherein the device further includes a housing, and the conduit extends through the housing, the housing including a sensor chamber positioned between and in fluid communication with the first and second portions of the conduit, and a element bore extending transverse to the conduit and providing access to the second portion of the conduit, and the movable element extends through the element bore.

25. A method of metering and controlling fluid flow through a fluid flow apparatus, the apparatus including a housing, a movable element, and first and second pressure sensors, the method comprising the steps of:

forming a conduit through the housing, the conduit including at least first, second and third portions, the first and third portions having a circular inner cross-section and the second portion including at least one planar sidewall;

forming first and second sensor chamber in the housing so as to be in fluid communication with respective first and second portions of the conduit and second and third portions of the conduit,

forming a element bore in the housing that extends transverse to the conduit and provides access to the second portion of the conduit;

moving the movable element in the element bore to control fluid flow in the conduit;

engaging the linear edge of the movable element with the at least one planar sidewall of the conduit when in the closed position to form a seal with the at least one planar sidewall;

determining a pressure differential between the first and second sensor chambers using a pressure signal provided by each of the first and second pressure sensors; and

metering the fluid flow based on the pressure differential.